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bulletin no. 27 from the N. Dakota Experiment Station. Two very interesting articles are "Twenty years progress in pathology" by B. T. Galloway, and "The botanic garden as an aid to agriculture" by William Trelease.— J. C. ARTHUR.

A NEW LABORATORY GUIDE for bacteriology by Mr. W. D. Frost, of the University of Wisconsin, is a convenient combination of directions for experiments, blank pages, charts, and outline drawings in which results may be recorded, together with some general information.[9]

The first part of the book is devoted to general bacteriology with the usual description of technique and laboratory methods. The medical part of the book is more complete than usual for an elementary text book.

General information is given in the form of brief notes wherever a germ is mentioned for study, relating its source, time of isolation and discoverer, with references to the original and other descriptions. A chapter on taxonomy includes Chester's scheme of nomenclature of cultural characters and Migula's valuable classification of bacteria.

The most striking features of the book are the well-outlined and systematic arrangement of material, and the unusual and deserved attention given to one of the most important problems in the study of bacteria today, the effect of environmental action. The chart blanks are excellently designed for the record of the numerous physiological and morphological characters of a culture under study. A useful supplement to these detailed record blanks would be a few charts such as those recommended by Fuller for recording definite position and negation reactions in comparative form. The book as it stands, however, is very complete and will be welcomed in many laboratories.— MARY HEFFERAN.

## NOTES FOR STUDENTS

THE great prevalence of potato blight (*Phytophthora infestans*) in the state of Washington for the past two years has led to the publication of a bulletin[10] on the subject by the Agricultural Experiment Station, based on experiments made at the Puyallup station. Bordeaux mixture applied before the disease began to be apparent and again after about two weeks was found to decrease materially the injury from the disease.— ERNST A. BESSEY.

PROFESSOR CONWAY MACMILLAN has been studying the growth periodicity of the potato tuber[11] by the method described in this journal (**16**: 149. 1891) which he has improved upon by employing a second wheel to magnify more the tracing of the auxanometer. He finds the increase in diameter rhythmic, with maxima once or twice or oftener in 24 hours, followed by minima when growth ceases or nearly so. There are indications of a grand period, and some connection between the periodic growth of the aerial parts and tubers.—C. R. B.

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[9] FROST, WILLIAM DODGE: A laboratory guide in elementary bacteriology. 4to pp. viii + 200. Published by the author. Madison, Wis. 1901.

[10] BRODIE, DAVID A.: Potato blight and its treatment. Bull. 46, Washington Agricultural Experiment Station, pp. 15, *figs. 5*. 1901. Pullman, Washington.

[11] Bull. Minn. Acad. Nat. Sci., **3**: 355–362. 1901.

MISS MATHILDE GOLDFLUS[12] finds that chlorophyll not only persists under the cork of many branches, but that it is present in the medullary rays, in the pith, and is even formed in the cortex of trunks of trees at the bottom of the crevices in a ridgy bark, as in Quercus and Robinia. Indeed it may develop in any living tissues. Photosynthesis by this chlorophyll is active, more than counterbalancing the production of $CO_2$ in respiration, though no quantitative determinations seem to have been made. Inasmuch as the area exposed by branches is considerable, and as photosynthesis continues in winter, it is evident that it is of considerable importance to the plant. Miss Goldflus and Mr. Miyake[13] have thus called attention to hitherto overlooked activity of the chloroplasts.—C. R. B.

S. KUSANO (Bot. Mag. Tokyo **15**: 42–46. 1901) has published a short account of the parasitism of *Buckleya Quadriala*, one of the Santalaceae of Japan. Its haustoria apparently attack the roots of almost any plant, as witnessed by the artificial cultures made. As a result of the attack the activity of the cambium of the host-root seems to be much increased, since a transverse section of that part shows the greatest diameter of wood and cortex. "If the age of a haustorium may be estimated from the annual rings of the host-root which overlie the sucking process, it is safe to conclude that the same organ of Buckleya can maintain its activity during fifteen years, and probably longer." The author found no difficulty in cultivating these green parasites by sowing the seeds in the same pots with the seeds of other plants which might serve as hosts.—J. M. C.

IN A RECENT PAPER Noll[14] takes up again the much discussed subject of polarity among the marine algae. Beginning with the statement that in *Bryopsis muscosa*, on which he worked, the polarity is as pronounced as in Pinus, he states as a result of his experiments that very few of his plants reversed their root and shoot poles when inverted. By measurements and dates he ascertained that the young and actively growing plants were so strongly polarized as to resume the original manner of growth; that only the older more slowly growing forms succumbed to the force of external conditions and turn root into shoot and shoot into root. Hence the inherited polarization is lost with age. These results agree with those of Winkler of an earlier date. To the definition of an "energid," as given by Sachs, Noll takes exception, and calls the Siphoneae "single but multinucleate energids," laying stress rather on the *Hautschicht* than on the nucleus with its dominated mass of protoplasm. He therefore defines the energid as a "one or many-nucleate plasmatic body enclosed in a definite wall."—PHILIP GRAEME WRIGHTSON.

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[12] Revue gén. de Bot. **13**: 49–92. 1901.

[13] Bot. Mag. Tokyo. **14**: 44. 1900. See Bot. Gaz. **30**: 141. 1900.

[14] On reversion experiments on Bryopsis, with remarks on energids. Ber. d. deut. bot. Gesell. **18**: 444–451. 1900.

"A rhizomorphic root-rot of fruit trees"[15] is the title of a recent bulletin of the Oklahoma Agricultural Experiment Station. For a number of years a serious root trouble, especially of the apple, has been attracting the attention of fruit growers and botanists in Missouri, Illinois, Oklahoma, and Texas, as well as in other regions. This has been shown by von Schrenk and others to be caused, in all probability, by a hitherto unidentified rhizomorph-producing fungus. In the present bulletin, based upon work taken up since last June, the disease is shown to attack other trees also than merely fruit trees, and is ascribed to a species of Clitocybe which is described as new under the name *C. parasitica*. This was found at the base of many diseased trees and was accordingly considered to be the cause of the disease. Most of the bulletin is given up to a discussion of previous work on diseases of trees caused by agarics, to a host index of these fungi as they affect trees, and to a long bibliography. The discussion of the disease under consideration is really limited to four or five pages.—ERNST A. BESSEY.

THE SUBJECT of asparagus rust is one that continues to attract attention. A recent bulletin by F. A. Sirrine[16] discusses the disease and its treatment in New York. All the stages of the rust are found to occur in the state. The variations in the distribution of the disease ascribed by some investigators to soil conditions seem rather to be due to the occurrence or non-occurrence of dews or dense fogs which furnish the moisture necessary for the germination of the spores. The measures usually recommended in combating this disease, viz., cutting and burning the affected fields early in the fall, are shown to be injurious to the plants and not of appreciable value in reducing the amount of rust next year. Using a specially devised spraying machine, which enabled the operators to wet all parts of the plants thoroughly, was found in two years trials under unfavorable conditions to effect a gain in the crop of 69.5 per cent. for the first year and of 47.8 per cent. for the second year. The best results were obtained with a Bordeaux mixture to which was added a solution of resin. Spraying was not found to be profitable where the disease had so weakened the plants that they gave less than one third of the normal crop.—ERNST A. BESSEY.

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[15] WILCOX, E. MEAD: A rhizomorphic root-rot of fruit trees. Bulletin 49, Oklahoma Agricultural Fxperiment Station. p. 32. *pls. 11.* February 1901. Stillwater, Oklahoma.

[16] SIRRINE, F. A.: Spraying for asparagus rust. I. Tests with resin-Bordeaux mixture. II. The Downs power asparagus sprayer. N. Y. Agric. Exper. St. Bull. no. 188, pp. 233–276. December 1900.

ATTENTION is called to a group of fungus diseases hitherto almost unnoticed in this country in a joint bulletin by B. M. Duggar and F. C. Stewart entitled "The sterile fungus Rhizoctonia as a cause of plant diseases in America."[17] The genus Rhizoctonia is a so-called form genus, *i. e.*, it consists of fungi whose spore forms are unknown but which agree generally in their vegetative characters. The fungus is characterized by a peculiar method of branching of the hyphae, by the formation of sclerotia, and by its usually parasitic habit on roots and underground parts of plants. The authors find that this fungus is present on many different hosts, including among the most important the potato, beet, bean, carnation, lettuce, and radish. Whether the same species affects all these plants still remains to be determined by cross-inoculations. In most if not all of the plants mentioned, the fungus causes a severe root-rot, which often results in the death of the host. That the fungus is the cause of the disease was proved in some of the cases by repeated inoculations with pure cultures. As the paper is in a measure only preliminary the discussion of the special morphology and physiology as well as of the taxonomy and relation to European forms is reserved for a later paper, in which will also be taken up the results of inoculation experiments. —ERNST A. BESSEY.

PROFESSOR G. J. PEIRCE[18] has published some interesting studies on *Sequoia sempervirens*, chiefly in connection with the development of suckers, a very unusual habit among Gymnosperms. The claim is made that reforesting is entirely possible if suckers and seedlings are not destroyed by fire. In the tendency of the suckers to fasciation the author confirms Frank's view that it is in consequence of an excess of food substances in available form. The most prominent feature of the paper, however, is the discussion of the albinism of certain suckers. These are by no means uncommon, and they differ decidedly in rate of growth, in resistance to cold, in leaf structure, etc., from green suckers. The author thinks that the albinism is due to the fact that the leaves form and attain nearly or quite full size when there is insufficient warmth for the formation of the chromoplasts and the chlorophyll, though enough for growth. One interesting feature of the albinism is that when a sucker begins white it always remains so, no matter how favorable the later conditions may be for the development of a green sucker. The author suggests as an explanation that the sucker is in unbroken connection with an abundant food supply, and that there is not the stimulus of need for a later production of chromoplasts and chlorophyll. The contribution closes with an interesting discussion of parasitism and heredity from the standpoint of white suckers. Attention is called to the fact that in this case absolute parasitism in habit and structure is developed by the environment in a single generation from a long line of independent plants It would seem to the author, therefore, that the influence of heredity is less powerful than the power of reaction to certain immediate stimuli, and he closes as follows: "May not this always be the case? May it not be that what we call heredity is really the response to similar stimuli and combinations of stimuli occurring in orderly succession in the course of nature?"—J. M. C.

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[17] DUGGAR, B. M. and STEWART, F. C.: The sterile fungus Rhizoctonia as a cause of plant diseases in America. Bull. 186, Cornell University Agricultural Experiment Station, Ithaca, N. Y. Bull. 186, New York Agricultural Experiment Station, Geneva, N. Y., p. 28, *figs. 9*. January 1901.

[18] Studies on the coast redwood (*Sequoia sempervirens* Endl.). Proc. Calif. Acad. Sci. III. Bot. **2**: 83–106. *pl. 14*. 1901.

BOTANICAL ARTICLES in annual reports of Agricultural Experiment stations, not heretofore noticed in these pages, are as follows: Report of the New York station for 1900 contains reprints, with admirable plates, of bulletins 161, 162, 163, 164, 167, 169, and 170, all of much interest to students of plant diseases and of some other topics. Report of the Wisconsin station for 1900 contains a number of original articles. S. M. Babcock and H. L. Russell discuss the "Causes operative in the production of silage," and arrive at the conclusions that the presence of bacteria is unessential and even deleterious, that the chief action is intramolecular respiration of the plant cells, producing carbon dioxid and organic acids in proportion to the length of time the cells remain alive and active, and that the aroma is due to the action of enzyms. These are unexpected and important results. The same authors describe with illustrations an excellent "Closed circuit respiration apparatus," which would be most useful in a laboratory of physiology. E. S. Goff reports on "Investigations of flower buds" and concludes that "in favorable seasons of flower formation, many of the buds formed that season, and nearly all those formed the preceding two seasons, that have not already flowered, will become flower-buds; an excessive apple crop results, which is necessarily followed by a light one, because the supply of reserve buds is exhausted." The same writer treats of "The resumption of root growth in spring" and "The effects of continued use of immature seed;" while F. Cranefield writes upon "Duration of the growth period in fruit trees." In the 7th Report (1899) of the Wyoming station are excellent "Alkali studies," dealing with the germination and growth of seeds, by B. C. Buffum and E. E. Slosson, and in the 10th Report (1900) Aven Nelson gives a list of "The cryptogams of Wyoming," including the algae, fungi, and mosses. Other botanical articles in these reports have previously been published as bulletins. The report of the botanists, George E. Stone and Ralph E. Smith, in the 11th Report of the Hatch (Mass.) station deals with a variety of fungal and physiological disorders of plants. In the 12th Report the same writers discuss a number of fungous diseases, especially tracing a relation between the abundance of asparagus rust and the physical character of the soil in conserving water. In the 19th Report of the New Jersey station, B. D. Halsted presents a varied annual report (80 pp.), similar to those of a number of years back for which he is so justly famous. Among the numerous topics taken up probably the most interesting are "Experiments with asparagus rust" and "Fungi as related to weather." In the 11th Report of the Rhode Island station (1898) H. J. Webber and J. A. Tillinghast present a large amount of interesting data upon the feeding of plants with chemical fertilizers, especially the use of lime on acid soils, the articles being well illustrated. The third part of the 22d Report of the Connecticut station (1898) opens with four articles by Wm. C. Sturgis on diseases of melons, lima beans, tobacco, peach, and use of fungicides. In the 14th Report of the Maine station W. M. Munson has interesting articles on "The blueberry in Maine," "A comparison of large and small radish seed," "The effect of sub-watering radishes," and "Pollination and fertilization of flowers." The botanists of the Vermont station, L. R. Jones and W. A. Orton, give in the 12th Report (1899) a valuable account of potato and apple diseases and their remedies, of killing weeds with chemicals, and of parasitic fungi of Vermont, being the second list.—J. C. ARTHUR.

WE ARE TO HAVE from Dr. Blackman, of the University of Cambridge, a series of papers on the algae, that will aim to give a critical account of the work that has accumulated since Wille's treatment in "Die natürlichen Pflanzenfamilien" of Engler and Prantl in 1890. The first paper[19] has recently appeared, and, excluding the Cyanophyceae, takes up the simpler types of algae, discussing the possible relationships and lines of evolution. The author starts his lines of development from the level of the Protococcoideae, and lays special stress on the Chlamydomonas-like forms, finding in their varied life histories several possibilities of evolution, worked out in different groups of the Chlorophyceae. There are three conspicuous tendencies, resulting in the well-known types of vegetative organization called by him the *volvocine*, *tetrasporine*, and *endosphaerine*.

The volvocine tendency lays emphasis upon the motile phases in the life history, and leads to the specialization and segregation of the ciliated cells in the complex coenobia of the Volvocales. A tendency on the part of resting cells to form filaments, cell plates, and membranes is termed tetrasporine, and results in forms like Tetraspora, Hormidium, etc., and through them leads to the thallus of the Confervales. In the endosphaerine condition vegetative division is reduced to a minimum, and in its place is found the peculiar form of multiplication illustrated by Pediastrum and Hydrodictyon. This is essentially a method of spore-formation with the peculiarity that the zoospores, unable to escape from the sporangium, settle down to form a new individual within the mother cell. These three conditions have been recognized by several phycologists, and probably express the history of events fairly correctly for this region of the algae, where the original conditions and later modifying factors seem relatively clear.

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[19] BLACKMAN, V. H.: The primitive Algae and Flagellata. An account of modern work bearing on the evolution of the Algae. Ann. Bot. 14: 647. 1900.

The Conjugales, Siphonales, and Diatomales form natural groups that cannot be closely related to the Protococcales or Confervales. They have not been treated in this paper, which deals chiefly with the Chlamydomonas-like organisms, flagellates, and a certain assemblage of forms termed the "Heterokontae." It is doubtful whether most botanists realize that the immense group of the Flagellata resembles the lower Volvocales so closely that no hard and fast line can be drawn between them and the algae. This relationship is treated at some length, and should be welcomed. In his remarks upon the primitive Phaeophyceae Dr. Blackman enters a field of acknowledged difficulty, and while he presents certain possibilities the reader cannot but realize that he is speculating in a region where there is a conspicuous paucity of knowledge.

The author of a paper of this character naturally lays himself open to criticism, for his is an attempt to connect and relate groups as definitely as possible with confessedly fragmentary evidence at hand. Certain difficulties are presented in this paper which cannot be easily overcome. Is not Chlamydomonas much too high a type on which to pivot so many evolutionary lines? What is to be done with the simplest of the Pleurococcaceae? There is little or no real evidence that they are degenerate forms, and this view seems to have its chief *raison d'être* as an assumption to dispose of a troublesome difficulty. Chlamydomonas is very complex as a cell, with its differentiated activities, sex, etc. There were, of course, immense stretches of simpler forms below this level, perhaps rising out of the Cyanophyceae. We know almost nothing of the cytology of the Pleurococcaceae, the Cryptomonadineae, and other border groups. It seems to the writer that we may hope for important results from this field of investigation. We shall probably have to go much farther back than Chlamydomonas before we can hope to clear the maze of relationships in the Pleurococcaceae.—B. M. DAVIS.